Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1 to 4. (canceled)

Claim 5. (currently amended) A method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line, wherein a number of times of passage of the steel product through the induction heating apparatuses is such that a heat treatment time, in which a surface ~~treatment~~ temperature of the steel product and a thickness-wise center temperature of the steel product are determined from the number of times of passage, a transfer speed of the steel product and an amount of electric power for the induction heating apparatuses, fall within a predetermined range, becomes the shortest,

and wherein ~~an optimum number of times of passage~~ heat treatment conditions in which the ~~number of times of passage~~ heat treatment time becomes the shortest ~~is~~ are determined by the following steps:

(a) determining the dimensions of the steel product and a necessary temperature rise of the steel product to be subjected to the heat treating,

(b) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is one,

(c) determining the transfer speed and the electric power for the induction heating apparatuses when the number of times of passage is not less than two,

(d) selecting the optimum number of times of passage in which the heat treatment time becomes the shortest, and determining the transfer speed and the amount of electric power for the induction heating apparatuses for each of the selected optimal number of times of passage.

Claim 6. (previously presented) The method of manufacturing a steel product according to claim 5, wherein when the heat

treating is carried out when the number of times of passage is three or more, a transfer speed of the steel product is changed every time of passage through the induction heating apparatuses.

Claim 7. (previously presented) The method of manufacturing a steel product according to claim 5, wherein when the heat treating is carried out with the number of times of passage being n which is equal to or more than three, transfer speeds of the steel product at a nth passage and at a (n-1)th passage are larger than those at a (n-2)th passage or before.

Claim 8. (currently amended) A method of manufacturing a steel product comprising heat treating a st
eel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line,

wherein a number of times of passage of the steel product through the induction heating apparatus is such that a heat treatment time, in which a surface temperature and a thickness-wise center temperature of the steel product are determined based

on the number of times of passage, a transfer speed of the steel product and an amount of electric power for the induction heating apparatuses fall within a predetermined temperature range within a target treatment time,

and wherein ~~an optimum number of times of passage is~~ heat treatment conditions in which the heat treatment time becomes within the target treatment time ~~and is~~ are determined by the following steps:

(a) determining the dimensions and a necessary temperature rise of the steel product to be subjected to the heat treating,

(b) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is one,

(c) determining the transfer of speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is not less than two,

(d) selecting the optimum number of times of passage, in which the heat treatment time becomes within the target treatment time, and determining the transfer speed and the amount of electric power for the induction heating apparatus for each of the selected optimum number of times of passage.

Claim 9. (previously presented) The method of manufacturing a steel product according to claim 8, wherein the target treatment time is set to a time which prevents a succeeding steel product from waiting in processes prior to the heat treating, or a time which results in a waiting time of a succeeding steel product being the shortest when the target treatment time has passed.

Claim 10. (previously presented) The method of manufacturing a steel product according to claim 9, wherein the target treatment time is calculated on the basis of a time at which cooling of a succeeding steel product is completed, or on the basis of the time at which the succeeding steel product arrives at the induction heating apparatuses.

Claim 11. (previously presented) The method of manufacturing a steel product according to claim 9, wherein the number of times of passage through the induction heating apparatuses is a number which results in a minimum electric power consumption, among such numbers of times the heat treatment time falls within the target treatment time.

Claim 12. (currently amended) A method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line, and

a surface temperature of the steel product and a temperature in a predetermined position inside the steel product are each determined as a variable based on the number of times of passage, a transfer speed of the steel product and an amount of electric power for the induction heating apparatuses,

wherein the steel product is subjected to the heat treating so that a heat treatment time, until the surface temperature of the steel product does not exceed a predetermined upper limit temperature and the temperature [[is]] in a predetermined position inside the steel product reaches a target temperature, falls within a target treatment time,

and wherein [[the]] heat treatment conditions in which the heat treatment time [[is]] becomes within the target treatment time [[is]] are determined by the following steps:

(a) determining the dimensions of the steel product and a necessary temperature rise of the steel product to be subjected to the heat treating,

(b) determining the transfer speed and the amount of electric power for the induction heating apparatus when the number of times of passage is one,

(c) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is not less than two,

(d) selecting an optimum number of times of passage, in which the heat treatment time becomes within the target treatment time, and determining the transfer speed and the amount of electric power for the induction heating apparatuses for each of the selected optimum number of times of passage.

Claim 13. (previously presented) The method of manufacturing a steel product according to claim 12, wherein the target treatment time is set to a time which prevents a succeeding steel product from waiting in processes prior to the heat treating, or a time which results in a waiting time of a succeeding steel product being the shortest when the target

treatment time has passed.

Claim 14. (previously presented) The method of manufacturing a steel product according to claim 13, wherein heating of the steel product is completed within the target treatment time and performed so that power consumption is at a minimum.

Claim 15. (previously presented) The method of manufacturing a steel product according to claim 13, wherein when the heat treating is carried out when the number of times of passage is three or more, and a transfer speed of the steel product at a last time of passage is larger than that at a first time of passage.

Claim 16. (currently amended) A method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line,

a surface temperature of the steel product and a temperature in a predetermined position inside the steel product are each determined as a variable based on the number of times of passage, a transfer speed of the steel product and an amount of electric power of the induction heating apparatuses,

wherein the steel product is subjected to the heat treating so that a heat treatment time, until the surface temperature of the steel product does not exceed a predetermined upper limit temperature and the temperature in a predetermined position inside the steel product reaches a target temperature, becomes the shortest,

and wherein ~~an optimum number of times of passage on~~ heat treatment conditions in which the ~~number of times of passage~~ heat treatment time becomes the shortest [[is]] are determined by the following steps:

(a) determining the dimension of the steel product and a necessary temperature rise of the steel product to be subjected to heat treating,

(b) determining the transfer speed and the amount of electric power when the number of times of passage is one,

(c) determining the transfer speed and the amount of electric

power for the induction heating apparatuses when the number of times of passage is less than two,

(d) selecting the number of times of passage, in which the heat treatment time becomes the shortest, and determining the transfer speed and the amount of electric power for the induction heating apparatuses for each of the selected optimum number of times of passage.

Claim 17. (previously presented) The method of manufacturing a steel product according to claim 16, wherein when the heat treating is carried out when the number of times of passage is three or more, and the transfer speed of the steel product at a last time of passage is larger than that at a first time of passage.

Claim 18. (previously presented) A method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product three or more times through two to five induction heating apparatuses, which are installed on the hot rolling line.

Claim 19. (previously presented) The method of manufacturing a steel product according to claim 18, wherein the heat treating is carried out with the number of times of passage, which prevents a succeeding steel product from waiting in processes prior to the heat treating, or which results in a waiting time of a succeeding steel product being the shortest when the succeeding steel material waits in the preceding process.

Claim 20. (previously presented) The method of manufacturing a steel product according to claim 19, wherein when the heat treating is carried out when the number of times of passage is three or more, and a transfer speed of the steel product at a last time of passage is larger than that at a first time of passage.

Claim 21. (canceled)

Claim 22. (previously presented) The method of manufacturing a steel product according to claim 5, wherein the method for determining the transfer speed of the steel product

and the amount of electric power for the induction heating apparatuses at each of the number of times of passage in the steps (b) and (c) comprises solving an optimization problem at every time of passage, in which the variables include the transfer speed of the steel product and the amount of the electric power for each induction heating apparatus, constraint conditions include the surface temperature of the steel product and the center temperature of the steel product are within a predetermined range of temperatures, and an objective function includes the heat treatment time and/or the amount of consumed electricity.

Claim 23. (previously presented) The method of manufacturing a steel product according to claim 22, wherein the optimization problem in the steps (b) and (c) is solved beforehand and wherein at least one of the transfer speed at every time of passage according to the dimensions of the steel product is stored in a table and the amount of electric power of each induction heating apparatus is stored in a table.

Claim 24. (previously presented) The method of manufacturing a steel product according to claim 8, wherein the method for determining the transfer speed of the steel product and the amount of electric power for the induction heating apparatuses at each of the number of times of passage in the steps (b) and (c) comprise solving an optimization problem at every time of passage in which variables include the transfer speed of the steel product and the amount of electric power for each induction heating apparatus, constraint conditions include the surface temperature of the steel product and the center temperature of the steel product are within a predetermined range of temperatures, and an objective function includes the heat treatment time and/or the amount of consumed electricity.

Claim 25. (previously presented) The method of manufacturing a steel product according to claim 24, wherein the optimization problem in the steps (b) and (c) is solved beforehand and wherein at least one of the transfer speed at every time of passage according to the dimensions of the steel product is stored in a table and the amount of electric power of each induction heating apparatus is stored in a table.

Claim 26. (previously presented) The method of manufacturing a steel product according to claim 12, wherein the method for determining the transfer speed of the steel product and the amount of electric power for the induction heating apparatuses at each of the number of times of passage in the steps (b) and (c) comprise solving an optimization problem at every time of passage in which variables include the transfer speed of the steel product and the amount of the electric power for each induction heating apparatus, constraint conditions include the surface temperature of the steel product and the center temperature of the steel product are within a predetermined range of temperatures, and an objective function includes the heat treatment time and/or the amount of consumed electricity.

Claim 27. (previously presented) The method of manufacturing a steel product according to claim 26, wherein the optimization problem in the steps (b) and (c) is solved beforehand and wherein at least one of the transfer speed at every time of passage according to the dimensions of the steel product is stored in a table and the amount of electric power of

each induction heating apparatus is stored in a table.

Claim 28. (previously presented) The method of manufacturing a steel product according to claim 16, wherein the method for determining the transfer speed of the steel product and the amount of electric power for the induction heating apparatuses at each of the number of times of passage in the steps (b) and (c) comprise solving an optimization problem at every time of passage in which variables include the transfer speed of the steel product and the amount of the electric power for each induction heating apparatus, constraint conditions include the surface temperature of the steel product and the center temperature of the steel product being within a predetermined range of temperatures, and an objective function includes the heat treatment time and/or the amount of consumed electricity.

Claim 29. (previously presented) The method of manufacturing a steel product according to claim 28, wherein the optimization problem in the steps (b) and (c) is solved

beforehand and wherein at least one of the transfer speed at every time of passage according to the dimensions of the steel product is stored in a table and the amount of electric power of each induction heating apparatus is stored in a table.